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SINGLE CRYSTAL COMPUTERS IN ANALYTICAL CONTROL INSTRUMENTS

18410231a Moscow AVTOMATIZATSIYA KHIMICHESKIKH PROIZVODSTV: EKSPRESS-INFORMATSIYA in Russian No 11, Nov 87 pp 22-24

[Article by S. N. Abdurakhmanov, I. A. Aronovich, V. V. Afonin, N. V. Babkin and A. B. Zyuzin, Chirchik Automation Design and Construction Bureau, "Khimavtomatika" Scientific Production Association]

[Abstract] Incorporation of integrated circuits into various measuring devices represents a novel approach to instrumentation combining computerized control and data processing. Advances in microprocessor design have in turn facilitated the production of small, rapid, and easily manageable and adaptable measuring instruments. At the Chirchik bureau design of analytical instrumentation has relied on the use of single crystal K1816VE35 computer in, for instance, the optical liquid analyzer Optika-P. The circuit design incorporates KR580VV55 interfaces, a KR580VI53 clock, and two PPZU K573RF2 chips. The high-level language utilized in some of the devices has been Iskra-1256. At the Chirchik bureau these concepts went into the design of photometric analyzers for measuring concentrations of solutions designated Chatkal, Delta, and Optika. The use of a standardized approach to the design of such devices has been cost-effective and highly productive.

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CHROMATOGRAPHIC ANALYSIS OF PURE CRYOGENIC GASES

18410230a Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 12, Dec 87 pp 22-24

[Article by A. V. Bobylev (dec), candidate of technical sciences, and G. A. Golovko, doctor of technical sciences]

[Abstract] The presence of gaseous impurities in commercial cryogenic gases has a serious impact on their use in many forms of technological processes, making purity standards a high-priority item in technology. Consideration of the impurity problem in the case of helium and argon carrier gases in chromatographic analyses led to a tabulation of impurities tolerable at the 10^{-4}% level or less. Only a combination of methods including low-temperature fractional distillation and adsorption on high-efficiency zeolites and molecular carbon sieves allows the preparation of argon and helium with this degree of purity (>99.9995%). The theoretical and experimental data underlying these standards for controlling impurity levels in carrier gases provided the foundation for recommending their production on an industrial scale. References 11: 8 Russian, 3 Western.

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STRUCTURE AND TECHNICAL ASPECTS OF TERMINAL CENTER OF AUTOMATED INFORMATION CENTER FOR CHEMISTRY AND CHEMICAL ENGINEERING

18410231c Moscow AVTOMATIZATSIYA KHIMICHESKIKH PROIZVODSTV: EKSPRESS-INFORMATSIYA in Russian No 11, Nov 87 pp 39-44

[Article by Yu. S. Ignatyev, NIITEKhIM [expansion unknown]]

[Abstract] Cursory description is provided of plans for terminal centers to serve automatic information centers providing technical, scientific, and economic information pertaining to chemistry and chemical engineering. Current plans call for the completion of 20 such terminal stations by 1990. The information that would be made available to subscribers would include 110 thousand documents for retrospective searches. The centers would accomodate some 5000 searchers per year via telecommunications, with approximately 15 h per week devoted to modern-based communication at each station. The stations are to be supported by a YeS-1055 computer, 1200/2400b/s-YeS 8013 modems, and YeS-7914 printers for hard copy documentation.

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SELF-PROPAGATING HIGH TEMPERATURE DECOMPOSITION

18410214a Novosibirsk IZVESTIYA SIBIRSKOGO OTDELENIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKIKH NAUK in Russian Vol 19, No 6, Nov-Dec 87 pp 73-78

[Article by A. I. Lesnikovich, V. V. Sviridov, S. V. Levchik and G. V. Printsev, Scientific Research Institute of Physicochemical Problems, Belorussian State University imeni V. I. Lenin, Minsk]

[Abstract] A review is presented on studies conducted on self-sustaining high-temperature decomposition of tetraperoxochromate (K_3CrO_8), treating the process as a unique form of solid state chemistry representing the reverse of self-propagating high-temperature synthesis. K_3CrO_8 was selected for the study since its high-temperature decomposition is not preceded by melting. Pressed cylindrical samples of 50 mcm grain K_3CrO_8 were ignited with a red-hot nichrome wire, with the rate of decomposition measured under nitrogen at pressures ranging from 0.1 to 10 MPa. Self-propagating decomposition differed from conventional thermolysis in that the latter proceeds at 120-200°C, whereas in the former the wavefront attains temperatures of 600°C. In self-propagating decomposition the fundamental reaction consists of the disproportionation of KO_2 according to the following scheme: $4\ KO_2 \rightleftarrows K_2O_3 + K_2O_5$. On cooling of the melt and its hardening, the equilibrium shifts to the left, so that the final product corresponds to those seen in low-temperature decomposition (i.e., $K_3CrO_8 = K_2CrO_4 + KO_2 + O_2 + 393J$). The entire process of self-propagating decomposition of K_3CrO_8 may be described with satisfactory accuracy by a polylinear function. Concomitant studies with hexachloromelamine and tetrazole-sodium tetrazolate mixture (3:2) confirmed the need for contact between the starting solid material and the products of combustion in the self-propagating process. Thus, the rate of this form of decomposition is controlled by the decomposition of the solid matter, an event that precedes the melting of the products. Physical features of the process included the absence of a flame in the gaseous phase and sputtering. Figures 1; references 23: 17 Russian, 6 Western.

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IMPROVEMENTS IN QUALITY CONTROL OF MINERAL FERTILIZERS

18410230b Moscow KHIMIZATSIYA SELSKOGO KHOZYAYSTVA in Russian No 1, Jan 88 pp 27-29

[Article by Ts. Ya. Glezer and Ye. P. Sychev, All-Union Scientific Research and Planning Institute for Storage Technology and Economics, and the Transportation and Application of Mineral Fertilizers]

[Abstract] Mobile laboratories capable of performing on-site quality control tests on new deliveries of mineral fertilizers appear to constitute an effective means of early detection of substandard products. On the basis of the preliminary chemical and physical analyses, suspected shipments should be referred to central agrochemical laboratories for more detailed studies and confirmation. The preliminary tests should include determination of the water content, ammonia levels, granulometric parameters, and granule friability. Experience in the Ryazan and Grodno oblasts has shown that monitoring new shipments of mineral fertilizers at railroad yards and on fields prior to application engender a cost benefit of five to 14 thousand rubles per year per site. For optimum efficiency, the range of the mobile laboratories should be limited to about 100 km. Figures 3.

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PYROELECTRIC PROPERTIES OF LEAD TITANATE FERROCERAMICS WITH VITREOUS DOPANTS

18410214c Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 6, Nov-Dec 87 (manuscript received 8 Oct 86) pp 655-657

[Article by E. Zh. Freydenfeld, R. Z. Kleyne, A. A. Bogomolov, T. A. Dabizha, O. N. Sergeyeva and T. K. Kutuzova, Riga Polytechnic Institute imeni A. Ya. Pelshe; Kalinin State University]

[Abstract] The generally-appreciated fact that introduction of vitreous dopants into ferroceramics may significantly improve the physical characteristics of the latter and diminish dielectric losses, led to the assessment of the dopant effects on pyroelectric properties. The studies were conducted with $PbTiO_3$ ferroceramics modified by addition of various quantities of La_2O_3, Nd_2O_3, MnO_2 or lead-containing vitreous agents. Pyroelectric coefficients were measured from samples heated by LG-75 laser (0.63 mcm, right-angle pulses at 25 Hz) representing dynamic experimental conditions, and in a quasi-static mode. Measurements at -22°C showed that the data obtained by both methods were essentially identical. The data showed that, with an increase in La, dielectric permeability increased from about 350 (5% substitution) to 1260 (15%), while the quality indicator decreased by an order of magnitude. Evaluation of temperature effects (-60 to +80°C) on the pyroelectric coefficient and the quality indicator showed both parameters to be relatively stable within this temperature range. Thus, $PbTiO_3$ ferroceramics, doped with vitreous agents, were shown to possess mechanical strength, electric stability, high phase transition temperatures, and extensive range of pyroelectric stability. With pyroelectric coefficients in the 0.4-3.3 $Cl \cdot cm^{-2} \cdot K^{-1}$ range these materials offer promise of sensitive heat sensors. Figures 1; references 6: 5 Russian, 1 Western.

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SYNTHESIS AND PESTICIDAL ACTIVITIES OF DERIVATIVES OF 3-(R-PHENYL)BENZO[f]-QUINOLINE AND R-BENZYL-2-NAPHTHYLAMINE

18410214b Minsk VYESTSI AKADEMII NAVUK BSSR: SERYYA KHIMICHNYKH NAVUK in Russian No 6, Nov-Dec 87 (manuscript received 9 Jan 87) pp 66-71

[Article by N. S. Kozlov and O. D. Zhikhareva, Institute of Physicoorganic Chemistry, Belorussian State University imeni V. I. Lenin]

[Abstract] In view of the demonstrated anticholinesterase, antiviral, and pesticidal activities of related compounds, a series of novel derivatives of 3-(R-phenyl)benzo[f]quinoline and R-benzyl-2-naphthylamine were synthesized for similar evaluations. Via catalytic condensation of 2-hydroxy-5-bromo-benzylidine-2-naphthylamine with acetone,1-methyl-3-(2-hydroxy-5-bromophenyl)-benzo[f]quinoline and N-(2-hydroxy-5-bromobenzyl)-2-naphthylamine were derived. The products were used for the synthesis of a quaternary salt, a carbamoyl, and a sulfonamide. Finally, reaction of iodomethylates of 1-methyl-3-(R-phenyl)benzo[f]quinolinium with 5-bromosalicylic aldehyde led to the synthesis of styryl derivatives, with R = H; 4-OCH_3; 3,4-(O_2CH_2); and 2-OH, 3-OCH_3. Testing against a variety of fungal and bacterial agents demonstrated that N-(2-hydroxy-5-bromobenzyl)-2-naphthylamine (I) showed the greatest activity, inhibiting the growth of Rhisoctonia solani by 77%, whereas the activity of the other agents was weak. However, I was toxic for cucumbers. Selective styryl derivatives were found to be markedly active against tomato phytophthorosis and against gray rot of beans. References 8: 2 Belorussian, 6 Russian.

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PRACTICAL APPLICATIONS AND CHARACTERISTICS OF SELMID

18410226b Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 12, Dec 87 (manuscript received 30 Sep 86) pp 95-100

[Article by Ya. G. Zandersons, D. Ya. Svikle, A. Ya. Prikule, E. E. Raminish and G. K. Baumane, Order of the Red Banner of Labor Institute of Wood Chemistry, Latvian SSR Academy of Sciences; "Sigra" Scientific Industrial Association]

[Abstract] The display of weak fungicidal activity by unsubstituted acid imides led to synthesis of N-substituted imides of maleopimaric acid. One of the N-(alkylaminomethyl)imides of maleopimaric acid, designated selmid, has been found to be an effective agricultural fungicide against such pathogens as powdery mildew, gray rot, and so forth, as well as a disinfectant that can be used in the presence of farm animals. Selmid is a moderately toxic agent, having an LD_{50} of 218 mg/kg for rats on intraperitoneal administration, and an LD_{50} = 1200 mg/kg per os. The cumulative potential of selmid is rated as negligible. Neither blood pressure nor myocardial function was affected as a result of occupational exposure to selmid. Three applications of 0.6% selmid in disinfection of pigstys was found to be the most effective method in reducing piglet mortality of various methods that were tried, yielding a 4.8% loss figure for piglets two months old or younger. The cost effectiveness of three selmid applications per litter was 34.91 rubles. Tables 5; references 6: 1 Latvian, 3 Russian, 2 Western.

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SELF-ADJUSTING SCHEME FOR SETTING REGULATOR IN POLYMERIZATION

18410231b Moscow AVTOMATIZATSIYA KHIMICHESKIKH PROIZVODSTV: EXPRESS-INFORMATSIYA in Russian No 11, Nov 87 pp 25-30

[Article by V. I. Dorofeyev, Voronezh Automation Design and Construction Bureau, "Khimavtomatika" Scientific Industrial Association]

[Abstract] Recent studies have demonstrated that oscillatory chemical phenomena may be utilized in chemical processes for desired ends, including that of polymerization. Numerical analyses have shown that oscillations in the availability of catalyst, described by $P = B + A \times \sin\omega t$, may be used to improve polymer quality by attenuating the dispersity of MW distributions. Optimal values for angular velocity of the oscillations, ω, lie in the range of 0.12 to 0.22 radians/min, depending on the desired degree of polydispersity. At the Voronezh bureau both theoretical and experimental studies were undertaken on the control of butadiene polymerization by the introduction of a catalyst concentration-dynamic viscosity loop into the control scheme, thus establishing an oscillatory control over the final product. Both the input (catalyst) and the output (viscosity) parameters were evaluated via Fourier analysis. The method was found effective in assuring continuous adjustments in controller setting to produce a product with the required characteristics, provided that the amplitude of the oscillations remained within a predetermined range compatible with efficient polymerization. Figures 2; references 3 (Russian).

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CURRENT STATUS AND PROSPECTS FOR RESEARCH ON PLANT RAW MATERIAL STRUCTURE AND PROCESSING

18410226a Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 12, Dec 87 (manuscript received 13 Oct 87) pp 35-44

[Article by A. P. Treymanis, A. F. Alksnis and U. E. Viyestur, Order of Red Banner of Labor Institute of Wood Chemistry, Latvian SSR Academy of Sciences]

[Abstract] A review article is presented on the progress of the Institute of Wood Chemistry in the processing of wood and its components. Much of the recent processing and research technology has been based on the appreciation of wood as a complex, multicomponent system of crosslinked polymers, containing 20-30% lignin. Among the more recent developments have been techniques other than the sulfate method for delignification. For example, detailed studies at the institute demonstrated the advantages of catalytic [quinone-based) delignification in the production of cellulose both in terms of rate of delignification and cellulose yield. However, application on an industrial scale has been hindered by the lack of a quinone supplier. Extensive studies are also being conducted on thermal destruction of wood and its components and the production of fodder and other products. Chemical processing of lignin has yielded a medicinal agent, designated bilignin, an efficient absorbent of bile acids. A novel approach has been taken to the synthesis of furfural that has increased the yield four-fold over more-conventional methods. Wood processing chemistry has been explored in detail to yield wood products showing improved fire resistance and less susceptibility to biodegradation. Various wood-based adhesives have been designed, as well as natural composite polymers that have found use in management of burns. In recent years, considerable attention has been accorded to processing various wood by- and waste-products that were presently being discarded. Figures 2; references 37: 35 Russian, 2 Western.

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COMPREHENSIVE SCIENTIFIC AND TECHNOLOGICAL PROGRAMS FOR QUALITY WOOD CHEMISTRY PRODUCTS

18410226c Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST in Russian No 8, Nov-Dec 87 pp 5-6

[Article by O. V. Skvortsova, A. N. Trofimov and V. K. Lipovetskaya, Central Scientific Research Institute of Wood Chemistry]

[Abstract] Comprehensive programs have been developed to ensure the production of high quality wood chemicals that could compete with the equivalent foreign products. The two programs--Kachestvo and Eksport--are designed to insure that a considerably higher fraction of the production meets the Znak Kachestva [quality] designation in the 12th Five Year Plan. In the first half of 1987, 73.5% of the production qualified for this designation. Tabular data are presented on a product-by-product basis of the anticipated Znak Kachestva percentages for individual products to be attained by 1990. For example, acetic acid, ethyl acetate, and butyl acetate are expected to retain their high quality standards of virtually 100% Znak Kachestva. Other products, such as the various forms of resin, tall oil, tallic fatty acids, and turpentine are expected to show improvements by ten percentage points or better. One of the most important factors in quality control rests on adequate and informative process data. Practical use of such data requires sophisticated statistical analysis and interpretation. References 3 (Russian).

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60th Anniversary of Founding of Institute of Physical Chemistry imeni L. V. Pisarzhevskiy, Ukrainian SSR Academy of Sciences

18410185 Kiev VISNYK AKADEMII NAUK UKRAYINSKOYI RSR in Ukrainian No 12, Dec 87 pp 74-82

[Article by V.D. Pokhodenko, academician, UkrSSR Academy of Sciences, and V.V. Zhylinska, candidate of chemical sciences]

[Excerpts] November 6, 1987, marked the 60th anniversary of the founding of the Order of the Red Banner of Labor Institute of Physical Chemistry imeni L.V. Pisarzhevskiy (IPC), one of the oldest and best known establishments of the UkrSSR Academy of Sciences (UAS).

Founded on the eve of the tenth anniversary of the Great October Socialist Revolution by the noted scientist and social activist Academician L.V. Pisarzhevskiy, IPC became one of the first specialized physicochemical institutes in the USSR and the first chemical institute in Ukraine. The creation of IPC provided proof of the concern shown by the young Soviet state for the development of chemistry and of the high regard for Ukrainian chemists, providing at the same time a powerful impetus for chemical research not only in Ukraine, but in the USSR as a whole. The IPC was first organized at the Scientific Research Chair of Electronic Chemistry of Dnepropetrovsk (then Katerinoslav) Mining Institute, headed by L.V. Pisarzhevskiy. At that time the institute included four departments and had a staff of thirty scientists. Initially, the IPC was under the USSR National Commissariat of Education, but in 1934 it was transferred to the UAS. In 1935 the IPC was named after its founder, academician L.V. Pisarzhevskiy.

L.V. Pisarzhevskiy remained as the first director of IPC until 1938. Subsequently, IPC was headed by his students: Professor V.A. Royter 1838-1939, UAS Academician O.I. Brodskiy 1939-1969, and UAS Academician K.B. Yatsymyrskiy 1969-1982.

The mandate of the institute at its founding included development of electronic concepts in chemistry, especially as applied to chemical structure, catalysis, theory of electrode processes, and the training of scientists. Even at that early stage L.V. Pisarzhevskiy was sensitive to the applied aspects of basic research. The pioneering studies at IPC exerted a profound

influence on the subsequent development of theoretical chemistry, electrochemistry, catalysis, and other aspects of chemistry. O.I. Brodskiy expanded studies on isotope chemistry and chemical reaction mechanisms. A general theory of isotope separation was developed, as well as methods for the isolation and analysis of the more important hydrogen, oxygen, and nitrogen isotopes. In 1934 O.I. Brodskiy prepared heavy water, a first in the USSR, an achievement that had a telling impact on the development of nuclear physics and of nuclear power for the national economy. These studies represented the beginning stages of basic and applied isotope chemistry. Through the fifties the institute remained the leading center in the USSR for the study and application of stable isotopes in chemistry.

In 1969 the institute was awarded the Red Banner of Labor for contributions made to the advancement of chemistry in both the basic and applied spheres, and for training highly qualified scientific cadres. In 1977 the IPC was awarded an honorable diploma by the presidium of the UkrSSR Supreme Soviet, and in 1982 was listed on the Board of Achievements of the Ukrainian SSR. For successes in socialist competition the institute was awarded the Red Banner of the UAS and the UkrSSR Trade Union Committee representing educators, higher schools, and research establishments. In 1987 the institute was again awarded a diploma by the presidium of the UkrSSR Supreme Soviet.

The institute is committed to celebrating its 60th anniversary by meeting the research challenges posed by the party for Soviet science within the framework of the restructuring program. Careful attention is being accorded to ensuring a greater research payoff in several important areas.

Restructuring of the planning and execution phases of research anticipates new emphasis on setting proper priorities in terms of the importance, scope, completion deadlines, practical implementation, and socioeconomic evaluation of research projects.

The purpose of restructuring the material, technical, and engineering support systems of research must be conducted in manner designed to provide timely availability of reagents, instruments, equipment, and other supplies. Included are plans for greater automation, as well as improvements in the information and patent and licensing services. Finally, the machining and pilot-plant installations must be expanded to accomodate experimental trials.

The staff will meet with greater demands for quality and productivity in their research. Attempts will be made to balance the staff better in terms of age, and to utilize all available financial resources in the form of incentives for scientific achievements in high-priority areas, and to improve the working and living conditions.

Management will bear greater responsibility for the quality and currency of research being undertaken, with equal importance being placed on efficient and responsive administrative practices.

Concrete measures have been implemented in each of these categories with telling changes.

For example, due to curtailment of relatively insignificant and inefficient projects falling into the 'naturalistic-social' [sic] category the total number of projects has been reduced. However, this meant an increase in the number of scientific and technical projects from three in 1985 to 12 in 1987, accompanied by a three-fold increase in practical implementation of research results. Completion dates have also been accelerated. During the 11th Five Year Plan only five of the 29 implementation plans were fulfilled; by comparison, during the 1986-1987 period 12 projects in the 'naturalistic-social' category were implemented . In view of these changes, the entire cycle of 'naturalistic-social' themes has been reduced from 18 research projects to 12 implementation programs at the IPC.

The number of cooperative studies being conducted jointly with other institutions has increased markedly in the 1985-1987 timeframe. Research at the IPC has become an integral part of the "Katalizator", "Membrany", and other programs of the Interdepartmental Science and Technology Committee. As the institute with primary responsibility the IPC has formulated the UAS program on "Development of Novel Catalysts and Catalytic Processes", and is currently engaged in completing the Ukrainian scientific program for high energy chemistry. Finally, IPC participates in over 30 All-Union, Ukrainian, and regional scientific and technical programs covering some 79 projects.

The thematic nature of the projects at IPC corresponds to the directives of the various administrative bodies of the USSR and the Ukrainian SSR, and is in accordance with various scientific programs currently in force, thereby signifying the immediacy and high priority of the research efforts.

Research at the IPC is under constant review for currency and efficiency. This is evident in the fact that research at the institute is conducted on a world-class basis, which finds further reflection in its application to the national economy and the ongoing interest that it generates among the various ministries and departments. These facts are self-evident in terms of cost-benefit analysis. The econonic benefit to be derived from implementation of the research results is expected to show a 1.5-fold improvement in the 12th Five Year Plan over the corresponding figure for the previous Plan. At the end of the current five year plan this indicator is expected to exceed 75 million rubles.

Nevertheless, in the final analysis it is the quality of scientists that determines the quality of research. In 1983 IPC initiated a new approach to performance evaluation. Taking a myriad of factors into consideration, criteria were developed for the performance evaluation of scientists and the engineering and technical staff. The advantage of the new practice over previous methods of evaluation lies in the fact that performance is assessed on research results, including their theoretical and practical aspects. The new approach to performance evaluation within the framework of restructuring and glasnost coincided, in 1986, with the implementation of the new salary system. These changes made it possible for the IPC to dismiss unproductive staff members and to recruit promising younger scientists, the education and training of whom the institute has always regarded as its primary mission.

Graduate students and their sponsors have to meet higher standards of quality and timeliness now applicable to dissertations, a development that has increased the number of students successfully completing their graduate training.

Glasnost at IPC has taken the form of extensive open and free discussions of scientific plans, trends, and accomplishments. Annual conferences designed to identify best scientific projects on a competitive basis have become a tradition at the institute, as have conferences of young scientists and review meetings of the scientific endeavors of the junior staff members. It is important to emphasize that these competitive measures enforce democratic principles and entail material rewards for superior scientific achievements. In order to further enhance material rewards for the efficiency and currency of high priority research projects the institute has used to the fullest extent the new powers granted to it to improve the salary scale of the staff and the bonus system, as well as to take qualifications into account in the renumeration scheme. These changes have impelled new interest in research quality and productivity.

The staff of IPC, having made a good start in the 12th Five-Year Plan, is well aware of its responsibilities and takes a realistic and critical approach toward liquidation of shortcomings. The institute has all the necessary means at its disposal for enhancing its efficiency and advancing 'perestroika'. The primary strength of the IPC lies in its staff, which is highly qualified, possesses a strong work ethic, and sound moral fibre. The other side of the coin consists of administrative efficiency and a tradition of excellence at the institute. Thus, the IPC has all the prerequisites necessary for making a greater contribution to the national economy and for accelerating scientific and technological advances.

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